CERN–PPE/95–138.
hep-ph/9509406
September, 4, 1995.

Measurement of the proton and the deuteron structure functions, F_2^p and F_2^d

THE NEW MUON COLLABORATION (NMC)

Bielefeld University[1+], *Freiburg University*[2+], *Max-Planck Institut für Kernphysik, Heidelberg*[3+], *Heidelberg University*[4+], *Mainz University*[5+], *Mons University*[6], *Neuchâtel University*[7], *NIKHEF*[8++], *Saclay DAPNIA/SPP*[9**], *University of California, Los Angeles*[10], *University of California, Santa Cruz*[11], *Paul Scherrer Institut*[12], *Torino University and INFN Torino*[13], *Uppsala University*[14], *Soltan Institute for Nuclear Studies, Warsaw*[15*], *Warsaw University*[16*]

M. Arneodo[13a)], A. Arvidson[14], B. Badełek[14,16], M. Ballintijn[8c)], G. Baum[1], J. Beaufays[8b)], I.G. Bird[3,8c)], P. Björkholm[14], M. Botje[12d)], C. Broggini[7e)], W. Brückner[3], A. Brüll[2f)], W.J. Burger[12g)], J. Ciborowski[8,16], R. van Dantzig[8], A. Dyring[14], H. Engelien[2h)], M.I. Ferrero[13], L. Fluri[7], U. Gaul[3], T. Granier[9], M. Grosse-Perdekamp[2i)], D. von Harrach[3j)], M. van der Heijden[8d)], C. Heusch[11], G. Igo[10], Q. Ingram[12], M. de Jong[8], E.M. Kabuß[3j)], R. Kaiser[2], H.J.Kessler[2], T.J. Ketel[8], F. Klein[5], S. Kullander[14], U. Landgraf[2], T. Lindqvist[14], G.K. Mallot[5], C. Mariotti[13l)], G. van Middelkoop[8], A. Milsztajn[9], Y. Mizuno[3m)], A. Most[3w)], A. Mücklich[3], J. Nassalski[15], D. Nowotny[3n)], J. Oberski[8], A. Paić[7], C. Peroni[13], B. Povh[3,4], K. Prytz[14v)], R. Rieger[5o)], K. Rith[3p)], K. Röhrich[5q)], E. Rondio[15], L. Ropelewski[16], A. Sandacz[15], D. Sanders[r)], C. Scholz[3n)], R. Seitz[5u)], F. Sever[1,8s)], T.-A. Shibata[4y)], M. Siebler[1], A. Simon[3t)], A. Staiano[13], M. Szleper[15], Y. Tzamouranis[3r)], M. Virchaux[9], J.L. Vuilleumier[7], T. Walcher[5], C. Whitten[10], R. Windmolders[6], A. Witzmann[2], F. Zetsche[3k)]

Submitted to Physics Letters

For footnotes see next page.

+ Supported by Bundesministerium für Forschung und Technologie.
++ Supported in part by FOM, Vrije Universiteit Amsterdam and NWO.
* Supported by KBN SPUB Nr 621/E - 78/SPUB/P3/209/94.
** Supported by CEA, Direction des Sciences de la Matière.

a) Now at Dipartimento di Fisica, Università della Calabria, 87036 Arcavacata di Rende (Cosenza), Italy.
b) Now at Trasys, Brussels, Belgium.
c) Now at CERN, 1211 Genève 23, Switzerland.
d) Now at NIKHEF, 1009 DB Amsterdam, The Netherlands.
e) Now at University of Padova, 35131 Padova, Italy.
f) Now at MPI für Kernphysik, 69029 Heidelberg, Germany.
g) Now at Université de Genève, 1211 Genève 4, Switzerland.
h) Now at LHS GmbH, 63303 Dreieich, Germany.
i) Now at University of California, Los Angeles, 90024 Ca, U.S.A.
j) Now at University of Mainz, 55099 Mainz, Germany.
k) Now at DESY, 22603 Hamburg, Germany.
l) Now at INFN-Istituto Superiore di Sanità, 00161 Roma, Italy.
m) Now at Osaka University, 567 Osaka, Japan.
n) Now at SAP AG, 69190 Walldorf, Germany.
o) Now at Comparex GmbH, 68165 Mannheim, Germany.
p) Now at University of Erlangen-Nürnburg, 91058 Erlangen, Germany.
q) Now at IKP2-KFA, 52428 Jülich, Germany.
r) Now at University of Houston, 77204 TX, U.S.A.
s) Now at ESRF, 38043 Grenoble, France.
t) Now at New Mexico State University, Las Cruces NM, U.S.A.
u) Now at Dresden University, 01062 Dresden, Germany.
v) Now at Stockholm University, 113 85 Stockholm, Sweden.
w) Now University of Illinois, Illinois, USA.
y) Now University of Tokyo, Tokyo, Japan.

Abstract

The proton and deuteron structure functions F_2^p and F_2^d were measured in the kinematic range $0.006 < x < 0.6$ and $0.5 < Q^2 < 75$ GeV^2, by inclusive deep inelastic muon scattering at 90, 120, 200 and 280 GeV. The measurements are in good agreement with earlier high precision results. The present and earlier results together have been parametrised to give descriptions of the proton and deuteron structure functions F_2 and their uncertainties over the range $0.006 < x < 0.9$.

1 Introduction

In this paper we present the structure functions of the proton and the deuteron, F_2^p and F_2^d, obtained from deep inelastic muon scattering at incident energies of 90, 120, 200 and 280 GeV. The data at 90 GeV and half of the data at 280 GeV have already been published [1]. The present analysis supersedes that of ref.[1]. The data cover the kinematic range $0.006 < x < 0.6$ and $0.5 < Q^2 < 75$ GeV^2.

The structure function $F_2(x, Q^2)$ reflects the momentum distribution of the quarks in the nucleon, an important aspect of its internal structure. The Q^2 dependence of F_2 can be used to determine the strong coupling constant, α_s, and the momentum distribution of the gluons, whereas the energy dependence of the cross section may be used to extract $R(x, Q^2)$, the ratio of the longitudinal and transverse virtual photon absorption cross sections.

The differential cross section for one-photon exchange can be written in terms of the nucleon structure function $F_2(x, Q^2)$ and the ratio $R(x, Q^2)$, as:

$$\begin{aligned}\frac{\mathrm{d}^2\sigma(x, Q^2, E)}{\mathrm{d}x\mathrm{d}Q^2} &= \frac{4\pi\alpha^2}{Q^4} \cdot \frac{F_2(x, Q^2)}{x} \cdot \\ &\cdot \left\{ 1 - y - \frac{Q^2}{4E^2} + (1 - \frac{2m^2}{Q^2}) \cdot \frac{y^2 + Q^2/E^2}{2\,(1 + R(x, Q^2))} \right\}, \end{aligned} \tag{1}$$

where α is the fine structure constant, $-Q^2$ the four-momentum transfer squared, E the energy of the incident muon and m the muon mass. The quantities x, the Bjorken scaling variable, and y are defined as $x = Q^2/2M\nu$ and $y = \nu/E$, where ν is the virtual photon energy in the laboratory frame and M is the proton mass. This one-photon exchange cross section is obtained from the measured differential cross section by correcting for higher order electroweak effects.

2 The experiment

The experiment (NMC–NA37) was performed at the M2 muon beam line of the CERN SPS. The data presented were taken in 1986 and 1987 at nominal incident energies of 90 and 280 GeV [1], and in 1989 at 120, 200 and 280 GeV. The spectrometer is described in refs. [2, 3]. The proton and deuteron differential cross sections were measured simultaneously with two pairs of 3 m long targets placed alternately in the muon beam. In one pair the upstream target was liquid hydrogen and the downstream one liquid deuterium, while in the other pair the order was reversed. The spectrometer acceptance was substantially different for the upstream and downstream targets, thereby giving two separate measurements of the structure function for each material.

The integrated incident muon flux was measured both by sampling the beam with a random trigger [4] and by recording the numbers of counts in two scintillator hodoscope planes used to determine incident beam tracks [1]. In both cases the beam tracks present in the triggers were reconstructed off-line, in the same way as for scattered muon triggers, to determine the integrated useable flux.

Uncertainties on the incident and scattered muon momenta are important sources of systematic error in F_2. The spectrometer which measured the scattered muon momentum (FSM) was calibrated to an accuracy of 0.2% using the reconstructed masses of J/ψ and K^0 mesons. The beam momentum measurement system (BMS) was calibrated in dedicated runs by measuring the average incident muon momentum in a purpose built spectrometer [5]. The BMS was also calibrated relative to the FSM in a series of runs using precision silicon microstrip detectors. The two BMS calibrations were averaged, leading to an accuracy of 0.2%.

The following selections were applied to the data (see table 1). The scattered muon momentum, p', was required to be above a certain value to suppress muons from pion and kaon decays. Events with small ν, where the spectrometer resolution is poor, were rejected. Regions with rapidly varying acceptance were excluded by requiring minimum scattering angles, θ_{min}. The maximum values of y and the mass squared of the hadronic final state, W^2, excluded the kinematic domain where higher order electroweak processes dominate. In addition, the position of the reconstructed vertex was constrained to be within one of the targets. At each value of x, data in regions of Q^2 where the acceptance was less than 30% of the maximum at that x were removed. Inefficient regions in the spectrometer were excluded. As in the previous analysis [1], the tracks reconstructed in the large drift chambers (W45) in front of the absorber were not used in the analysis.

3 Data analysis and results

The extraction of the structure functions from the measured cross sections requires the evaluation of the higher order electroweak contributions and thus the a priori knowledge of the structure functions themselves. Also, the correction for the effects of kinematic smearing requires the knowledge of the event distributions in the (x, Q^2) plane and thus the knowledge of the cross sections. Therefore, the structure functions were determined iteratively.

A Monte Carlo simulation of the experiment was performed. At each iteration, the Monte Carlo events were weighted with the best knowledge of the total cross section, i.e. the one-photon exchange cross section computed from parametrisations of F_2 and R, corrected for higher order electroweak processes. By comparing the Monte Carlo simulation with the data, a new parametrisation of F_2 was determined for each target material. Convergence was considered to be attained when the values of F_2 changed by less than 0.2 %, in practice after two iterations. A phenomenological 15-parameter function, given in eq. (2) below, was used to parametrise F_2. The parametrisation of R was taken from ref. [7] and kept fixed in the iteration.

Separate Monte Carlo simulations were performed for each period of data taking. This enabled changes in the beam and the detector to be taken into account. The simulation of the experiment was checked by comparing the distributions of data and Monte Carlo events in variables not or only weakly related to x and Q^2.

As in ref.[1] the uncertainty in the determination of the spectrometer acceptance was studied by comparing the structure functions determined separately from the up-

stream and the downstream targets, for which the spectrometer has largely different acceptances. In addition, this uncertainty was studied by comparing the structure function results obtained using two different methods. In the first one a common parametrisation was used to determine the structure function for all energies simultaneously. In the second method the cross sections were initially extracted for each data period and target position separately, and afterwards combined to determine the structure function. These studies led to an estimated contribution to the systematic error on F_2 of the order of 2%, reaching 4% at the edge of the kinematic domain. A further systematic error, of up to 2% in the small x and large y region, was attributed to F_2 to account for uncertainties in the effect of hadronic and electromagnetic showers on the reconstruction efficiency.

The higher order electromagnetic contributions to the cross section and their uncertainties were calculated as in refs. [1, 2] using the method of Akhundov, Bardin and Shumeiko [8]. These contributions to the cross sections were at most one third. The consequent systematic errors on F_2 arise predominantly from the uncertainties in R, in the proton form factor and in the suppression of the quasi-elastic scattering on the deuteron. The uncertainty in R contributes both here and through the calculation of the one-photon cross section (eq. (1)).

The normalisation uncertainty of the data at each incident energy, relative to the fitted function describing F_2 used in the iteration, is estimated to be 2%. This is included in the 2.5% total normalisation uncertainty of the combined data.

The results obtained for the structure functions F_2^p and F_2^d averaged over all energies are presented as a function of Q^2 for fixed values of x in figs. 1 and 2. The values of $F_2^p(x,Q^2)$ and $F_2^d(x,Q^2)$ and the various contributions to the systematic errors are given in tables 4 and 5. In figs. 1 and 2 the error bars represent the statistical errors, while the quadratic sum of the various systematic uncertainties is given by the lines, which are drawn relative to the function fitted to the data and do not include any normalisation uncertainty.

An indication of the uncertainty in the Q^2 dependence of F_2 due to the relative normalisation uncertainties is illustrated in fig. 3. Here the function fitted to the F_2 results is compared to a similar fit with the 90 GeV data lowered by 2% and the other three data sets raised by 2%.

4 Discussion

Our results are in good agreement with those of SLAC [9] and BCDMS [10]. We have used the results of these experiments and the present one to obtain parametrisations of the structure functions F_2^p and F_2^d and their uncertainties, using the 15-parameter function [6]:

$$F_2(x,Q^2) = A(x) \cdot \left(\frac{\ln(Q^2/\Lambda^2)}{\ln({Q_0}^2/\Lambda^2)}\right)^{B(x)} \cdot \left(1 + \frac{C(x)}{Q^2}\right), \qquad (2)$$

with $Q_0^2 = 20\ \mathrm{GeV}^2$, $\Lambda = 0.250\ \mathrm{GeV}$ and
$A(x) = x^{a_1} \cdot (1-x)^{a_2} \cdot \{a_3 + a_4(1-x) + a_5(1-x)^2 + a_6(1-x)^3 + a_7(1-x)^4\}$,

$B(x) = b_1 + b_2 x + b_3/(x + b_4)$,
$C(x) = c_1 x + c_2 x^2 + c_3 x^3 + c_4 x^4$.

In the fits, the individual data points were weighted using their statistical errors only. Five additional normalisation parameters were fitted to the data to describe relative normalisation shifts between the four NMC data sets taken at different energies and the SLAC and the BCDMS data, weighted according to their normalisation uncertainties (2% for the four NMC sets, 2% for the SLAC data and 3% for the BCDMS results). Optimal agreement between the experiments was found with the changes in normalisation given in table 2. An additional free parameter was included to account for a possible miscalibration of the scattered muon energy in the BCDMS data and was determined from the fit to be +0.2% for both the proton and the deuteron data. The parameters of eq. (2) resulting from the fits are given in table 3.

To determine the total uncertainties in the parametrised structure functions F_2^p and F_2^d, we also took the systematic errors and their correlations into account. The total errors on F_2^p and F_2^d are between 1.5% and 5% and include the normalisation uncertainty. The upper and lower limits of the structure functions F_2 were fitted with the function of eq. (2) and the resulting parameter values are listed in table 3.

The result of the fit for the deuteron is shown in fig. 4 together with the merged NMC data and the SLAC and BCDMS results. In the figure, the points have been renormalised according to the values resulting from the fit, and the BCDMS data have also been adjusted for the 0.2% energy recalibration mentioned above.

Recently, preliminary structure function results became available from the fixed target experiment E665 at Fermilab [11]. These data extend to very small x (0.0004). In fig. 5 our data are compared with the E665 results in the overlapping x region. The agreement is generally good, although for small x there is a tendency for these data to be above those presented here.

In fig. 6 we present a comparison of the NMC data with the results published by the H1 [12] and ZEUS [13] collaborations at HERA. Again, the agreement is good, except for the lowest x bin.

5 Summary

We have presented the proton and deuteron structure functions F_2^p and F_2^d in the kinematic range $0.006 < x < 0.6$ and $0.5 < Q^2 < 75$ GeV^2, obtained from inclusive deep inelastic muon scattering experiments at 90, 120, 200 and 280 GeV. The combined results have high statistical accuracy and the systematic uncertainties are between 2% and 5%. The data are in good agreement with the results from SLAC and BCDMS. Agreement is also observed with the Fermilab E665 data, while published data on F_2 from the HERA experiments H1 and ZEUS are consistent with the present results for $x \geq 0.01$.

The present results together with the earlier high precision data of SLAC and BCDMS were parametrised to give descriptions of the proton and deuteron structure functions F_2 and their uncertainties over the range $0.006 < x < 0.9$.

References

[1] NMC, P. Amaudruz et al., Phys. Lett.**B 295** (1992) 159.

[2] NMC, P. Amaudruz et al., Nucl. Phys. **B 371** (1992) 3.

[3] M. van der Heijden, Ph.D. Thesis, University of Amsterdam (1991);
I.G. Bird, Ph.D. Thesis, Free University, Amsterdam (1992);
A. Brüll, Ph.D. Thesis, Freiburg University (1992);
T. Granier, Ph.D. Thesis, Université Pierre et Marie Curie, Paris (1994);
P. Björkholm, Ph.D. Thesis, Uppsala University (1995).

[4] R.P. Mount, Nucl. Instrum. Methods **187** (1981) 401.

[5] M. Arneodo, Ph.D. Thesis, Princeton University (1992).

[6] A. Milsztajn et al., Z. Phys. **C 49** (1991) 527.

[7] L.W. Whitlow et al., Phys. Lett. **B 250** (1990) 193.

[8] A.A. Akhundov et al., Sov. J. Nucl. Phys. **26** (1977) 660; 44 (1986) 988;
JINR-Dubna preprints E2-10147 (1976), E2-10205 (1976), E2-86-104 (1986);
D. Bardin and N. Shumeiko, Sov. J .Nucl. Phys. **29** (1979) 499.

[9] L.W. Whitlow et al., SLAC, Phys.Lett **B 282** (1992) 475.

[10] BCDMS Collab., A.C. Benvenuti et al., Phys. Lett. **B 233** (1989) 485;
BCDMS Collab., A.C. Benvenuti et al., Phys. Lett. **B 237** (1990) 592.

[11] E665 Collab., presented at the 30th Rencontres de Moriond, March 1995; A.V. Kotwal, Ph.D. Thesis, Harvard University (1995).

[12] H1 Collab., T. Ahmed et al., Nucl. Phys. **B 439** (1995) 471.

[13] ZEUS Collab., M. Derrick et al., Z. Phys. **C 65** (1995) 627.

Incident energy [GeV]	p'_{min} [GeV]	ν_{min} [GeV]	θ^{up}_{min} [mrad]	θ^{down}_{min} [mrad]	y_{max}	W^2_{max} [GeV^2]	N_p [10^3]	N_d [10^3]
90	15	7	13	15	0.9	130	255	533
120	20	10	13	15	0.9	150	103	215
200	35	20	13	15	0.9	250	56	114
280	40	30	13	15	0.9	400	141	406

Table 1: Cuts applied to the data, as explained in the text. Different values of θ_{min} were used for the upstream and downstream targets, as indicated. N_p and N_d are the total number of events for protons and deuterons, respectively, after applying all cuts.

Data set	Proton	Deuteron
SLAC	+0.1%	+0.4%
NMC 90 GeV	–2.2%	–2.7%
NMC 120 GeV	+1.6%	+1.4%
NMC 200 GeV	+1.2%	+1.6%
NMC 280 GeV	+0.8%	+0.5%
BCDMS	–2.3%	–1.9%

Table 2: Normalisation changes for the different data sets. All numbers were obtained from the fits described in section 4.

		Limits			Limits	
Parameter	F_2^p	Upper F_2^p	Lower F_2^p	F_2^d	Upper F_2^d	Lower F_2^d
a_1	-0.02778	-0.05711	-0.01705	-0.04858	-0.04715	-0.02732
a_2	2.926	2.887	2.851	2.863	2.814	2.676
a_3	1.0362	0.9980	0.8213	0.8367	0.7286	0.3966
a_4	-1.840	-1.758	-1.156	-2.532	-2.151	-0.608
a_5	8.123	7.890	6.836	9.145	8.662	4.946
a_6	-13.074	-12.696	-11.681	-12.504	-12.258	-7.994
a_7	6.215	5.992	5.645	5.473	5.452	3.686
b_1	0.285	0.247	0.325	-.008	-.048	0.141
b_2	-2.694	-2.611	-2.767	-2.227	-2.114	-2.464
b_3	0.0188	0.0243	0.0148	0.0551	0.0672	0.0299
b_4	0.0274	0.0307	0.0226	0.0570	0.0677	0.0396
c_1	-1.413	-1.348	-1.542	-1.509	-1.517	-2.128
c_2	9.366	8.548	10.549	8.553	9.515	14.378
c_3	-37.79	-35.01	-40.81	-31.20	-34.94	-47.76
c_4	47.10	44.43	49.12	39.98	44.42	53.63

Table 3: The values of the parameters of eq. (2) for F_2^p and F_2^d. The limits correspond to the total uncertainties in F_2 as explained in the text.

Table 4: The proton structure function $F_2^p(x, Q^2)$ from the measurements at 90, 120, 200 and 280 GeV, averaged over all energies. In this table the value of F_2 and its statistical and total systematic errors are given for each x and Q^2. The mean y of the events in this bin is also given. Also listed is the measured cross section ($\mathrm{d}^2\sigma^{meas}/\mathrm{d}x\mathrm{d}Q^2$) at the same x and Q^2. The systematic error is the quadratic sum of the contributions given as percentages of F_2 in the columns 4–8. The contributions are: E, E', errors due to calibrations of incident and scattered muon energies; AC, error in the determination of the spectrometer acceptance; RC, error from the radiative corrections; RE, error from the reconstruction inefficiency due to showers.

x	Q^2 [GeV^2]	y	E [%]	E' [%]	AC [%]	RC [%]	RE [%]	$d^2\sigma^{meas}/dxdQ^2$ [$\mathrm{b} \cdot \mathrm{GeV}^{-2}$]	$F_2^p \pm \Delta F_2^{stat} \pm \Delta F_2^{syst}$
0.0080	0.800	0.617	0.6	0.1	2.3	1.7	0.3	0.928E-05	0.2760 ± 0.0031 ± 0.0081
0.0080	1.130	0.744	0.5	0.0	2.1	1.8	0.5	0.495E-05	0.2955 ± 0.0055 ± 0.0085
0.0080	3.470	0.855	0.1	0.5	2.1	1.8	2.0	0.747E-06	0.3715 ± 0.0103 ± 0.0128
0.0125	0.900	0.444	0.7	0.3	1.6	0.8	0.2	0.546E-05	0.2859 ± 0.0064 ± 0.0056
0.0125	1.240	0.582	0.6	0.1	1.6	1.3	0.3	0.280E-05	0.3112 ± 0.0034 ± 0.0068
0.0125	1.670	0.665	0.5	0.1	1.5	1.3	0.5	0.159E-05	0.3238 ± 0.0055 ± 0.0069
0.0125	2.730	0.604	0.6	0.1	1.5	1.1	1.2	0.675E-06	0.3816 ± 0.0177 ± 0.0087
0.0125	3.260	0.710	0.5	0.0	1.7	1.2	1.3	0.471E-06	0.3626 ± 0.0172 ± 0.0092
0.0125	4.520	0.714	0.1	0.5	2.0	2.3	1.7	0.260E-06	0.3924 ± 0.0076 ± 0.0137
0.0125	5.390	0.839	0.1	0.5	2.2	2.5	1.9	0.201E-06	0.4279 ± 0.0099 ± 0.0167
0.0175	1.270	0.444	0.8	0.2	1.1	0.7	0.2	0.213E-05	0.3111 ± 0.0049 ± 0.0048
0.0175	1.730	0.557	0.6	0.1	1.2	0.9	0.3	0.112E-05	0.3432 ± 0.0047 ± 0.0057
0.0175	2.290	0.635	0.5	0.0	1.1	1.0	0.5	0.641E-06	0.3550 ± 0.0060 ± 0.0060
0.0175	3.620	0.567	0.6	0.1	1.5	1.2	1.1	0.290E-06	0.3848 ± 0.0129 ± 0.0087
0.0175	4.330	0.674	0.5	0.0	1.6	1.7	1.3	0.198E-06	0.4067 ± 0.0157 ± 0.0112
0.0175	5.600	0.632	0.1	0.5	1.9	2.2	1.5	0.126E-06	0.4168 ± 0.0100 ± 0.0137
0.0175	6.730	0.749	0.1	0.5	2.1	2.3	1.7	0.877E-07	0.4128 ± 0.0066 ± 0.0146
0.0250	1.270	0.315	1.0	0.5	0.4	0.6	0.1	0.166E-05	0.3177 ± 0.0058 ± 0.0043
0.0250	1.760	0.415	0.8	0.3	0.7	0.5	0.2	0.843E-06	0.3401 ± 0.0042 ± 0.0041
0.0250	2.410	0.517	0.7	0.1	0.8	0.7	0.3	0.433E-06	0.3620 ± 0.0035 ± 0.0045
0.0250	3.340	0.628	0.6	0.0	1.0	1.2	0.5	0.223E-06	0.3825 ± 0.0072 ± 0.0066
0.0250	4.540	0.500	0.7	0.1	1.3	1.2	1.0	0.138E-06	0.3979 ± 0.0112 ± 0.0085
0.0250	5.450	0.595	0.6	0.0	1.5	1.6	1.1	0.919E-07	0.4009 ± 0.0112 ± 0.0101
0.0250	7.090	0.587	0.1	0.0	1.7	1.5	1.3	0.565E-07	0.4207 ± 0.0061 ± 0.0110
0.0250	8.890	0.694	0.1	0.5	2.0	1.7	1.5	0.358E-07	0.4427 ± 0.0061 ± 0.0136
0.0250	10.800	0.833	0.1	0.5	2.1	2.1	1.9	0.261E-07	0.4732 ± 0.0112 ± 0.0169
0.0350	1.300	0.229	1.3	0.7	0.3	0.2	0.1	0.124E-05	0.3183 ± 0.0087 ± 0.0048
0.0350	1.760	0.307	1.0	0.5	0.2	0.2	0.1	0.665E-06	0.3429 ± 0.0061 ± 0.0040
0.0350	2.450	0.396	0.8	0.2	0.4	0.3	0.2	0.330E-06	0.3716 ± 0.0043 ± 0.0038
0.0350	3.420	0.491	0.7	0.1	0.6	0.8	0.3	0.164E-06	0.3905 ± 0.0060 ± 0.0048
0.0350	4.390	0.584	0.6	0.1	0.8	1.5	0.5	0.963E-07	0.3939 ± 0.0098 ± 0.0074
0.0350	5.460	0.458	0.6	0.0	1.0	0.9	0.8	0.694E-07	0.3946 ± 0.0128 ± 0.0067
0.0350	6.960	0.542	0.6	0.1	1.2	1.1	1.1	0.422E-07	0.4257 ± 0.0101 ± 0.0089
0.0350	9.000	0.531	0.1	0.0	1.5	1.0	1.2	0.262E-07	0.4121 ± 0.0074 ± 0.0088
0.0350	11.440	0.638	0.1	0.5	1.7	1.6	1.4	0.157E-07	0.4355 ± 0.0061 ± 0.0122
0.0350	14.110	0.777	0.1	0.5	2.0	2.2	1.7	0.104E-07	0.4531 ± 0.0104 ± 0.0156

x	Q^2 [GeV^2]	y	E [%]	E' [%]	AC [%]	RC [%]	RE [%]	$d^2\sigma^{meas}/dxdQ^2$ [b $\cdot$ GeV^{-2}]	$F_2^p \pm \Delta F_2^{stat} \pm \Delta F_2^{syst}$
0.0500	1.330	0.166	1.7	1.1	0.9	0.1	0.1	0.889E-06	0.3422 ± 0.0101 ± 0.0077
0.0500	1.760	0.218	1.3	0.8	0.4	0.1	0.1	0.504E-06	0.3413 ± 0.0059 ± 0.0054
0.0500	2.480	0.287	1.0	0.5	0.2	0.2	0.1	0.247E-06	0.3539 ± 0.0037 ± 0.0041
0.0500	3.440	0.367	0.8	0.3	0.2	0.4	0.2	0.123E-06	0.3841 ± 0.0045 ± 0.0039
0.0500	4.450	0.436	0.7	0.1	0.3	0.8	0.3	0.717E-07	0.3796 ± 0.0063 ± 0.0044
0.0500	5.440	0.417	0.7	0.0	0.5	0.7	0.5	0.478E-07	0.3836 ± 0.0083 ± 0.0046
0.0500	6.890	0.415	0.6	0.0	0.7	0.6	0.8	0.314E-07	0.3874 ± 0.0079 ± 0.0053
0.0500	9.060	0.422	0.1	0.1	0.9	0.7	0.9	0.187E-07	0.3957 ± 0.0072 ± 0.0059
0.0500	11.490	0.479	0.1	0.0	1.2	0.9	1.0	0.115E-07	0.4202 ± 0.0054 ± 0.0076
0.0500	14.870	0.583	0.1	0.5	1.4	1.4	1.3	0.657E-08	0.4229 ± 0.0051 ± 0.0103
0.0500	18.910	0.731	0.1	0.5	1.7	2.1	1.6	0.392E-08	0.4486 ± 0.0077 ± 0.0142
0.0700	1.350	0.120	2.3	1.7	1.1	0.1	0.1	0.654E-06	0.3232 ± 0.0142 ± 0.0099
0.0700	1.770	0.156	1.8	1.2	0.6	0.1	0.1	0.378E-06	0.3536 ± 0.0086 ± 0.0078
0.0700	2.490	0.207	1.3	0.8	0.3	0.1	0.1	0.187E-06	0.3580 ± 0.0050 ± 0.0056
0.0700	3.470	0.270	1.1	0.5	0.3	0.2	0.1	0.936E-07	0.3829 ± 0.0053 ± 0.0046
0.0700	4.450	0.325	0.9	0.3	0.3	0.4	0.2	0.549E-07	0.3799 ± 0.0067 ± 0.0041
0.0700	5.450	0.376	0.8	0.2	0.3	0.5	0.3	0.356E-07	0.3869 ± 0.0092 ± 0.0040
0.0700	6.890	0.337	0.7	0.1	0.4	0.4	0.5	0.226E-07	0.3992 ± 0.0097 ± 0.0042
0.0700	8.920	0.366	0.7	0.0	0.6	0.5	0.8	0.138E-07	0.3997 ± 0.0110 ± 0.0051
0.0700	11.510	0.365	0.1	0.1	0.8	0.5	0.8	0.848E-08	0.4155 ± 0.0075 ± 0.0052
0.0700	14.920	0.434	0.1	0.0	1.1	0.7	0.9	0.488E-08	0.4034 ± 0.0059 ± 0.0065
0.0700	19.650	0.546	0.1	0.6	1.4	1.3	1.2	0.266E-08	0.4191 ± 0.0060 ± 0.0096
0.0700	25.560	0.705	0.1	0.5	1.7	2.2	1.5	0.148E-08	0.4630 ± 0.0132 ± 0.0151
0.0900	1.380	0.096	2.9	2.3	0.8	0.0	0.1	0.508E-06	0.3456 ± 0.0214 ± 0.0130
0.0900	1.760	0.121	2.2	1.6	0.4	0.0	0.1	0.309E-06	0.3475 ± 0.0110 ± 0.0097
0.0900	2.490	0.163	1.6	1.0	0.2	0.1	0.1	0.151E-06	0.3721 ± 0.0066 ± 0.0073
0.0900	3.470	0.213	1.3	0.7	0.3	0.1	0.1	0.753E-07	0.3677 ± 0.0061 ± 0.0054
0.0900	4.450	0.257	1.1	0.4	0.4	0.2	0.1	0.444E-07	0.3756 ± 0.0074 ± 0.0046
0.0900	5.460	0.300	0.9	0.3	0.4	0.3	0.2	0.286E-07	0.3771 ± 0.0096 ± 0.0043
0.0900	6.810	0.293	0.9	0.2	0.5	0.3	0.4	0.183E-07	0.3899 ± 0.0093 ± 0.0044
0.0900	8.900	0.301	0.8	0.1	0.7	0.3	0.6	0.109E-07	0.3778 ± 0.0119 ± 0.0048
0.0900	11.560	0.290	0.1	0.3	1.0	0.3	0.7	0.668E-08	0.3925 ± 0.0091 ± 0.0050
0.0900	14.910	0.349	0.1	0.1	1.2	0.4	0.7	0.388E-08	0.4007 ± 0.0074 ± 0.0060
0.0900	19.820	0.436	0.1	0.0	1.5	0.7	0.9	0.209E-08	0.3949 ± 0.0063 ± 0.0077
0.0900	26.070	0.560	0.1	0.6	1.9	1.4	1.2	0.112E-08	0.3998 ± 0.0082 ± 0.0106
0.1100	1.780	0.100	2.7	2.1	0.6	0.0	0.1	0.253E-06	0.3528 ± 0.0135 ± 0.0121
0.1100	2.500	0.134	1.9	1.3	0.2	0.0	0.1	0.124E-06	0.3620 ± 0.0077 ± 0.0085
0.1100	3.470	0.178	1.5	0.8	0.3	0.1	0.1	0.625E-07	0.3766 ± 0.0075 ± 0.0064
0.1100	4.460	0.216	1.2	0.6	0.4	0.1	0.1	0.368E-07	0.3735 ± 0.0083 ± 0.0052
0.1100	5.470	0.250	1.1	0.4	0.4	0.1	0.1	0.238E-07	0.3708 ± 0.0101 ± 0.0046
0.1100	6.820	0.251	1.0	0.3	0.6	0.2	0.3	0.152E-07	0.3662 ± 0.0093 ± 0.0044
0.1100	8.930	0.258	0.9	0.2	0.8	0.2	0.5	0.888E-08	0.3762 ± 0.0129 ± 0.0050
0.1100	11.500	0.248	0.2	0.1	1.1	0.2	0.7	0.549E-08	0.3662 ± 0.0100 ± 0.0047
0.1100	14.920	0.291	0.1	0.2	1.3	0.2	0.7	0.319E-08	0.3795 ± 0.0085 ± 0.0058
0.1100	19.800	0.360	0.1	0.0	1.7	0.4	0.8	0.174E-08	0.3850 ± 0.0070 ± 0.0072
0.1100	26.370	0.464	0.1	0.6	2.0	0.7	1.0	0.915E-09	0.3724 ± 0.0077 ± 0.0089
0.1100	34.480	0.604	0.2	0.5	2.3	1.4	1.3	0.492E-09	0.4285 ± 0.0167 ± 0.0130

x	Q^2 [GeV^2]	y	E [%]	E' [%]	AC [%]	RC [%]	RE [%]	$d^2\sigma^{meas}/dxdQ^2$ [b $\cdot$ GeV^{-2}]	F_2^p $\pm\Delta F_2^{stat}$ $\pm\Delta F_2^{syst}$
0.1400	1.860	0.082	3.2	2.6	1.1	0.0	0.1	0.188E-06	0.3772 $\pm$ 0.0224 $\pm$ 0.0162
0.1400	2.490	0.110	2.3	1.7	0.7	0.0	0.1	0.101E-06	0.3704 $\pm$ 0.0073 $\pm$ 0.0111
0.1400	3.480	0.141	1.7	1.1	0.3	0.0	0.1	0.496E-07	0.3743 $\pm$ 0.0064 $\pm$ 0.0078
0.1400	4.460	0.172	1.4	0.8	0.2	0.1	0.1	0.292E-07	0.3579 $\pm$ 0.0065 $\pm$ 0.0059
0.1400	5.470	0.201	1.2	0.6	0.3	0.1	0.1	0.190E-07	0.3431 $\pm$ 0.0076 $\pm$ 0.0048
0.1400	6.840	0.212	1.1	0.4	0.5	0.1	0.2	0.118E-07	0.3551 $\pm$ 0.0070 $\pm$ 0.0047
0.1400	8.940	0.213	1.0	0.3	0.8	0.1	0.4	0.686E-08	0.3742 $\pm$ 0.0112 $\pm$ 0.0053
0.1400	11.390	0.217	0.2	0.2	1.1	0.1	0.7	0.426E-08	0.3692 $\pm$ 0.0091 $\pm$ 0.0050
0.1400	14.960	0.233	0.2	0.3	1.4	0.1	0.6	0.247E-08	0.3646 $\pm$ 0.0069 $\pm$ 0.0058
0.1400	19.790	0.289	0.2	0.2	1.7	0.2	0.6	0.136E-08	0.3591 $\pm$ 0.0054 $\pm$ 0.0068
0.1400	26.550	0.374	0.2	0.0	2.1	0.4	0.8	0.711E-09	0.3683 $\pm$ 0.0058 $\pm$ 0.0084
0.1400	35.200	0.489	0.2	0.5	2.4	0.9	1.0	0.373E-09	0.3572 $\pm$ 0.0098 $\pm$ 0.0100
0.1800	2.670	0.092	2.7	2.0	1.2	0.0	0.1	0.685E-07	0.3701 $\pm$ 0.0111 $\pm$ 0.0131
0.1800	3.480	0.114	2.1	1.4	0.7	0.0	0.1	0.384E-07	0.3397 $\pm$ 0.0075 $\pm$ 0.0088
0.1800	4.470	0.135	1.7	1.0	0.3	0.0	0.1	0.225E-07	0.3646 $\pm$ 0.0080 $\pm$ 0.0072
0.1800	5.470	0.158	1.4	0.7	0.1	0.0	0.1	0.146E-07	0.3304 $\pm$ 0.0085 $\pm$ 0.0054
0.1800	6.870	0.175	1.2	0.5	0.4	0.1	0.2	0.894E-08	0.3466 $\pm$ 0.0078 $\pm$ 0.0049
0.1800	8.890	0.174	1.1	0.4	0.8	0.1	0.4	0.525E-08	0.3446 $\pm$ 0.0118 $\pm$ 0.0049
0.1800	11.330	0.192	1.0	0.3	1.1	0.1	0.5	0.320E-08	0.3488 $\pm$ 0.0109 $\pm$ 0.0056
0.1800	14.970	0.183	0.2	0.4	1.4	0.1	0.6	0.186E-08	0.3333 $\pm$ 0.0079 $\pm$ 0.0054
0.1800	19.860	0.229	0.2	0.2	1.8	0.1	0.6	0.102E-08	0.3343 $\pm$ 0.0060 $\pm$ 0.0063
0.1800	26.660	0.294	0.2	0.1	2.1	0.3	0.6	0.536E-09	0.3359 $\pm$ 0.0061 $\pm$ 0.0074
0.1800	35.140	0.378	0.2	0.5	2.4	0.5	0.8	0.289E-09	0.3491 $\pm$ 0.0081 $\pm$ 0.0092
0.1800	45.750	0.490	0.2	0.5	2.7	0.9	1.0	0.157E-09	0.3650 $\pm$ 0.0153 $\pm$ 0.0111
0.2250	2.900	0.080	2.8	2.1	1.0	0.0	0.1	0.456E-07	0.3389 $\pm$ 0.0321 $\pm$ 0.0123
0.2250	3.510	0.097	2.2	1.5	0.7	0.0	0.1	0.295E-07	0.3372 $\pm$ 0.0089 $\pm$ 0.0094
0.2250	4.490	0.112	1.8	1.1	0.3	0.0	0.1	0.172E-07	0.3258 $\pm$ 0.0079 $\pm$ 0.0069
0.2250	5.470	0.129	1.5	0.8	0.2	0.0	0.1	0.113E-07	0.3340 $\pm$ 0.0090 $\pm$ 0.0059
0.2250	6.880	0.154	1.3	0.6	0.5	0.0	0.1	0.684E-08	0.3234 $\pm$ 0.0079 $\pm$ 0.0049
0.2250	8.870	0.154	1.1	0.4	0.8	0.1	0.3	0.400E-08	0.3109 $\pm$ 0.0103 $\pm$ 0.0046
0.2250	11.370	0.158	1.0	0.3	1.1	0.1	0.5	0.240E-08	0.3445 $\pm$ 0.0111 $\pm$ 0.0056
0.2250	15.030	0.148	0.2	0.4	1.4	0.1	0.6	0.138E-08	0.3104 $\pm$ 0.0080 $\pm$ 0.0050
0.2250	19.860	0.185	0.2	0.2	1.7	0.1	0.6	0.764E-09	0.3034 $\pm$ 0.0058 $\pm$ 0.0056
0.2250	26.720	0.237	0.2	0.1	2.0	0.2	0.6	0.403E-09	0.3117 $\pm$ 0.0060 $\pm$ 0.0066
0.2250	35.290	0.305	0.2	0.5	2.3	0.3	0.6	0.218E-09	0.2986 $\pm$ 0.0070 $\pm$ 0.0073
0.2250	46.570	0.401	0.2	0.5	2.5	0.6	0.8	0.116E-09	0.3114 $\pm$ 0.0118 $\pm$ 0.0087
0.2750	3.750	0.085	2.2	1.4	1.6	0.0	0.1	0.201E-07	0.3063 $\pm$ 0.0149 $\pm$ 0.0093
0.2750	4.470	0.101	1.8	1.0	1.1	0.0	0.1	0.134E-07	0.3105 $\pm$ 0.0104 $\pm$ 0.0072
0.2750	5.480	0.109	1.5	0.7	0.8	0.0	0.1	0.859E-08	0.3058 $\pm$ 0.0101 $\pm$ 0.0057
0.2750	6.890	0.128	1.2	0.5	0.9	0.0	0.1	0.519E-08	0.3038 $\pm$ 0.0086 $\pm$ 0.0050
0.2750	8.820	0.156	1.0	0.3	1.1	0.0	0.1	0.302E-08	0.3032 $\pm$ 0.0125 $\pm$ 0.0047
0.2750	11.450	0.135	1.0	0.2	1.3	0.0	0.4	0.177E-08	0.2761 $\pm$ 0.0111 $\pm$ 0.0047
0.2750	14.910	0.143	0.9	0.0	1.5	0.1	0.5	0.102E-08	0.2900 $\pm$ 0.0110 $\pm$ 0.0053
0.2750	19.880	0.152	0.2	0.1	1.7	0.1	0.6	0.566E-09	0.2789 $\pm$ 0.0065 $\pm$ 0.0051
0.2750	26.740	0.195	0.2	0.1	1.9	0.1	0.5	0.299E-09	0.2610 $\pm$ 0.0060 $\pm$ 0.0052
0.2750	35.340	0.253	0.2	0.2	2.1	0.2	0.5	0.162E-09	0.2778 $\pm$ 0.0071 $\pm$ 0.0061
0.2750	46.990	0.332	0.3	0.5	2.3	0.4	0.6	0.856E-10	0.2726 $\pm$ 0.0110 $\pm$ 0.0067
0.2750	59.790	0.418	0.3	0.5	2.4	0.7	1.3	0.492E-10	0.1865 $\pm$ 0.0284 $\pm$ 0.0054

x	Q^2 [GeV^2]	y	E [%]	E' [%]	AC [%]	RC [%]	RE [%]	$d^2\sigma^{meas}/dxdQ^2$ [b $\cdot$ GeV^{-2}]	F_2^p $\pm \Delta F_2^{stat}$ $\pm \Delta F_2^{syst}$
0.3500	4.620	0.082	1.5	0.7	4.6	0.0	0.1	0.882E-08	0.2773 $\pm$ 0.0118 $\pm$ 0.0136
0.3500	5.460	0.097	1.2	0.3	3.6	0.0	0.1	0.589E-08	0.2578 $\pm$ 0.0095 $\pm$ 0.0098
0.3500	6.970	0.106	0.9	0.0	2.3	0.0	0.1	0.341E-08	0.2685 $\pm$ 0.0072 $\pm$ 0.0066
0.3500	8.820	0.124	0.7	0.2	2.1	0.0	0.1	0.202E-08	0.2482 $\pm$ 0.0087 $\pm$ 0.0056
0.3500	11.320	0.150	0.6	0.3	2.0	0.1	0.2	0.116E-08	0.2331 $\pm$ 0.0117 $\pm$ 0.0049
0.3500	14.830	0.126	0.5	0.4	1.9	0.0	0.6	0.663E-09	0.2171 $\pm$ 0.0080 $\pm$ 0.0045
0.3500	20.240	0.128	0.4	0.5	1.8	0.0	0.6	0.348E-09	0.2229 $\pm$ 0.0057 $\pm$ 0.0045
0.3500	26.670	0.155	0.3	0.5	2.0	0.1	0.5	0.193E-09	0.2131 $\pm$ 0.0043 $\pm$ 0.0045
0.3500	35.420	0.201	0.3	0.5	2.3	0.1	0.5	0.104E-09	0.2135 $\pm$ 0.0048 $\pm$ 0.0053
0.3500	46.650	0.259	0.3	0.5	2.6	0.2	0.5	0.565E-10	0.2180 $\pm$ 0.0064 $\pm$ 0.0060
0.3500	61.210	0.337	0.4	0.5	2.8	0.4	1.2	0.305E-10	0.2312 $\pm$ 0.0190 $\pm$ 0.0073
0.5000	5.730	0.072	1.4	2.6	11.0	0.0	0.1	0.252E-08	0.1569 $\pm$ 0.0158 $\pm$ 0.0178
0.5000	6.930	0.087	1.3	2.5	9.1	0.0	0.1	0.156E-08	0.1680 $\pm$ 0.0075 $\pm$ 0.0160
0.5000	8.880	0.093	1.4	2.6	6.8	0.0	0.1	0.848E-09	0.1356 $\pm$ 0.0062 $\pm$ 0.0100
0.5000	11.270	0.105	1.5	2.7	4.7	0.0	0.2	0.481E-09	0.1412 $\pm$ 0.0074 $\pm$ 0.0079
0.5000	14.370	0.133	1.2	2.4	2.7	0.0	0.2	0.274E-09	0.1321 $\pm$ 0.0099 $\pm$ 0.0051
0.5000	20.050	0.110	2.0	3.2	1.5	0.0	0.7	0.133E-09	0.1167 $\pm$ 0.0057 $\pm$ 0.0048
0.5000	27.240	0.115	0.7	0.6	1.8	0.0	0.5	0.677E-10	0.1154 $\pm$ 0.0034 $\pm$ 0.0025
0.5000	35.510	0.142	0.7	0.6	3.0	0.1	0.5	0.378E-10	0.1086 $\pm$ 0.0027 $\pm$ 0.0034
0.5000	46.630	0.183	0.7	0.5	3.9	0.1	0.4	0.206E-10	0.1012 $\pm$ 0.0033 $\pm$ 0.0041
0.5000	62.340	0.243	0.7	0.5	4.6	0.3	1.1	0.107E-10	0.1081 $\pm$ 0.0086 $\pm$ 0.0052

Table 5: The deuteron structure function $F_2^d(x,Q^2)$ from the measurements at 90, 120, 200 and 280 GeV, averaged over all energies. In this table the value of F_2 and its statistical and total systematic errors are given for each x and Q^2. The mean y of the events in this bin is also given. Also listed is the measured cross section ($\mathrm{d}^2\sigma^{meas}/\mathrm{d}x\mathrm{d}Q^2$) at the same x and Q^2. The systematic error is the quadratic sum of the contributions given as percentages of F_2 in the columns 4–8. The contributions are: E, E', errors due to calibrations of incident and scattered muon energies; AC, error in the determination of the spectrometer acceptance; RC, error from the radiative corrections; RE, error from the reconstruction inefficiency due to showers.

x	Q^2 [GeV^2]	y	E [%]	E' [%]	AC [%]	RC [%]	RE [%]	$d^2\sigma^{meas}/dxdQ^2$ [$\mathrm{b}\cdot\mathrm{GeV}^{-2}$]	$F_2^d \pm\Delta F_2^{stat} \pm\Delta F_2^{syst}$
0.0080	0.800	0.617	0.6	0.1	2.1	1.7	0.3	0.874E-05	0.2698 ± 0.0026 ± 0.0075
0.0080	1.120	0.747	0.5	0.0	1.0	1.9	0.5	0.452E-05	0.2890 ± 0.0044 ± 0.0064
0.0080	3.460	0.854	0.1	0.5	1.8	1.9	2.0	0.670E-06	0.3755 ± 0.0086 ± 0.0124
0.0125	0.900	0.444	0.7	0.3	2.7	0.8	0.2	0.523E-05	0.2769 ± 0.0054 ± 0.0080
0.0125	1.230	0.582	0.6	0.1	1.7	1.3	0.3	0.266E-05	0.3015 ± 0.0027 ± 0.0068
0.0125	1.670	0.667	0.5	0.0	1.0	1.4	0.5	0.149E-05	0.3230 ± 0.0044 ± 0.0060
0.0125	2.730	0.604	0.6	0.1	1.0	1.1	1.2	0.644E-06	0.3597 ± 0.0143 ± 0.0071
0.0125	3.250	0.709	0.5	0.0	1.1	1.3	1.3	0.445E-06	0.3583 ± 0.0140 ± 0.0078
0.0125	4.520	0.713	0.1	0.5	1.2	2.4	1.7	0.245E-06	0.3829 ± 0.0060 ± 0.0122
0.0125	5.380	0.838	0.1	0.5	1.3	2.6	1.9	0.183E-06	0.4169 ± 0.0078 ± 0.0148
0.0175	1.270	0.444	0.7	0.2	2.0	0.7	0.2	0.204E-05	0.3082 ± 0.0041 ± 0.0070
0.0175	1.730	0.559	0.6	0.1	1.3	0.9	0.3	0.106E-05	0.3411 ± 0.0037 ± 0.0061
0.0175	2.280	0.637	0.5	0.0	1.0	1.1	0.5	0.606E-06	0.3436 ± 0.0045 ± 0.0055
0.0175	3.620	0.567	0.6	0.1	1.1	1.2	1.1	0.277E-06	0.3737 ± 0.0104 ± 0.0076
0.0175	4.330	0.673	0.5	0.0	1.2	1.8	1.3	0.187E-06	0.3945 ± 0.0122 ± 0.0100
0.0175	5.600	0.631	0.1	0.5	1.3	2.0	1.5	0.120E-06	0.3974 ± 0.0076 ± 0.0113
0.0175	6.730	0.748	0.1	0.5	1.4	2.2	1.7	0.821E-07	0.4130 ± 0.0052 ± 0.0131
0.0250	1.270	0.315	1.0	0.5	2.2	0.3	0.1	0.160E-05	0.3063 ± 0.0050 ± 0.0075
0.0250	1.760	0.416	0.8	0.3	1.4	0.5	0.2	0.805E-06	0.3325 ± 0.0034 ± 0.0056
0.0250	2.410	0.519	0.6	0.1	0.9	0.7	0.3	0.412E-06	0.3513 ± 0.0027 ± 0.0048
0.0250	3.340	0.629	0.6	0.0	0.9	1.2	0.5	0.210E-06	0.3650 ± 0.0052 ± 0.0060
0.0250	4.540	0.500	0.7	0.1	1.0	1.1	1.0	0.131E-06	0.3871 ± 0.0090 ± 0.0075
0.0250	5.450	0.595	0.6	0.0	1.2	1.5	1.1	0.871E-07	0.3906 ± 0.0085 ± 0.0090
0.0250	7.090	0.586	0.1	0.1	1.4	1.4	1.3	0.537E-07	0.4011 ± 0.0046 ± 0.0095
0.0250	8.880	0.694	0.1	0.5	1.5	1.7	1.6	0.337E-07	0.4294 ± 0.0046 ± 0.0122
0.0250	10.790	0.832	0.1	0.5	1.7	2.1	1.9	0.238E-07	0.4460 ± 0.0081 ± 0.0149
0.0350	1.300	0.229	1.3	0.7	2.2	0.4	0.1	0.119E-05	0.3141 ± 0.0078 ± 0.0085
0.0350	1.760	0.307	1.0	0.5	1.3	0.3	0.1	0.637E-06	0.3254 ± 0.0050 ± 0.0056
0.0350	2.450	0.398	0.8	0.2	0.7	0.4	0.2	0.314E-06	0.3537 ± 0.0033 ± 0.0042
0.0350	3.410	0.494	0.7	0.1	0.5	0.8	0.3	0.156E-06	0.3696 ± 0.0043 ± 0.0044
0.0350	4.390	0.585	0.6	0.0	0.7	1.4	0.5	0.908E-07	0.3704 ± 0.0069 ± 0.0065
0.0350	5.450	0.466	0.6	0.0	0.8	0.9	0.8	0.654E-07	0.3764 ± 0.0097 ± 0.0059
0.0350	6.950	0.541	0.6	0.1	1.1	1.1	1.1	0.400E-07	0.3925 ± 0.0074 ± 0.0077
0.0350	8.990	0.532	0.1	0.1	1.3	1.0	1.2	0.247E-07	0.3967 ± 0.0056 ± 0.0081
0.0350	11.440	0.637	0.1	0.5	1.6	1.5	1.4	0.148E-07	0.4163 ± 0.0045 ± 0.0111
0.0350	14.100	0.776	0.1	0.5	1.8	2.2	1.7	0.959E-08	0.4303 ± 0.0074 ± 0.0144

x	Q^2 [GeV^2]	y	E [%]	E' [%]	AC [%]	RC [%]	RE [%]	$d^2\sigma^{meas}/dxdQ^2$ [b $\cdot$ GeV^{-2}]	$F_2^d \pm \Delta F_2^{stat} \pm \Delta F_2^{syst}$
0.0500	1.330	0.166	1.7	1.1	2.6	0.4	0.1	0.848E-06	0.3305 ± 0.0091 ± 0.0108
0.0500	1.760	0.218	1.3	0.8	1.3	0.4	0.1	0.480E-06	0.3266 ± 0.0051 ± 0.0067
0.0500	2.480	0.288	1.0	0.4	0.5	0.3	0.1	0.235E-06	0.3421 ± 0.0030 ± 0.0043
0.0500	3.440	0.370	0.8	0.2	0.2	0.4	0.2	0.117E-06	0.3636 ± 0.0034 ± 0.0036
0.0500	4.440	0.438	0.7	0.1	0.3	0.7	0.3	0.675E-07	0.3638 ± 0.0046 ± 0.0040
0.0500	5.430	0.435	0.7	0.0	0.4	0.7	0.5	0.449E-07	0.3759 ± 0.0062 ± 0.0043
0.0500	6.870	0.420	0.6	0.0	0.6	0.6	0.7	0.295E-07	0.3819 ± 0.0061 ± 0.0050
0.0500	9.050	0.425	0.1	0.1	0.9	0.6	0.9	0.176E-07	0.3817 ± 0.0054 ± 0.0056
0.0500	11.480	0.480	0.1	0.0	1.2	0.8	1.0	0.108E-07	0.3959 ± 0.0039 ± 0.0072
0.0500	14.870	0.583	0.1	0.5	1.5	1.3	1.3	0.614E-08	0.4029 ± 0.0037 ± 0.0099
0.0500	18.900	0.731	0.1	0.5	1.9	2.0	1.6	0.363E-08	0.4158 ± 0.0053 ± 0.0134
0.0700	1.350	0.120	2.2	1.6	3.5	0.5	0.1	0.617E-06	0.3215 ± 0.0134 ± 0.0143
0.0700	1.770	0.156	1.7	1.1	1.8	0.4	0.1	0.357E-06	0.3297 ± 0.0074 ± 0.0092
0.0700	2.490	0.208	1.3	0.7	0.5	0.4	0.1	0.177E-06	0.3411 ± 0.0042 ± 0.0056
0.0700	3.460	0.271	1.0	0.4	0.2	0.3	0.1	0.880E-07	0.3602 ± 0.0042 ± 0.0042
0.0700	4.450	0.328	0.9	0.3	0.4	0.3	0.2	0.514E-07	0.3555 ± 0.0049 ± 0.0038
0.0700	5.440	0.379	0.8	0.2	0.5	0.5	0.3	0.334E-07	0.3649 ± 0.0066 ± 0.0040
0.0700	6.860	0.351	0.7	0.1	0.5	0.4	0.5	0.210E-07	0.3706 ± 0.0070 ± 0.0040
0.0700	8.910	0.369	0.7	0.0	0.5	0.4	0.7	0.129E-07	0.3655 ± 0.0081 ± 0.0045
0.0700	11.500	0.368	0.1	0.1	0.8	0.5	0.8	0.789E-08	0.3808 ± 0.0055 ± 0.0048
0.0700	14.900	0.437	0.1	0.0	1.1	0.7	1.0	0.454E-08	0.3866 ± 0.0043 ± 0.0064
0.0700	19.640	0.546	0.1	0.6	1.5	1.2	1.2	0.247E-08	0.3826 ± 0.0041 ± 0.0089
0.0700	25.560	0.705	0.1	0.5	1.9	2.2	1.5	0.136E-08	0.4119 ± 0.0087 ± 0.0137
0.0900	1.380	0.096	2.7	2.2	4.4	0.4	0.1	0.474E-06	0.3322 ± 0.0198 ± 0.0187
0.0900	1.760	0.121	2.1	1.5	2.6	0.4	0.1	0.288E-06	0.3282 ± 0.0097 ± 0.0122
0.0900	2.480	0.163	1.6	1.0	0.9	0.4	0.1	0.141E-06	0.3445 ± 0.0055 ± 0.0073
0.0900	3.470	0.214	1.2	0.6	0.2	0.3	0.1	0.702E-07	0.3423 ± 0.0049 ± 0.0048
0.0900	4.450	0.259	1.0	0.4	0.5	0.3	0.1	0.412E-07	0.3584 ± 0.0057 ± 0.0045
0.0900	5.460	0.304	0.9	0.3	0.7	0.2	0.2	0.266E-07	0.3645 ± 0.0071 ± 0.0044
0.0900	6.800	0.305	0.8	0.2	0.8	0.4	0.3	0.170E-07	0.3610 ± 0.0067 ± 0.0045
0.0900	8.880	0.306	0.8	0.1	0.8	0.3	0.6	0.100E-07	0.3733 ± 0.0092 ± 0.0048
0.0900	11.550	0.294	0.2	0.2	0.8	0.3	0.7	0.618E-08	0.3618 ± 0.0068 ± 0.0041
0.0900	14.910	0.351	0.1	0.1	0.8	0.4	0.8	0.357E-08	0.3665 ± 0.0053 ± 0.0044
0.0900	19.790	0.437	0.1	0.1	1.2	0.7	0.9	0.193E-08	0.3665 ± 0.0044 ± 0.0062
0.0900	26.060	0.560	0.1	0.6	1.6	1.3	1.2	0.103E-08	0.3777 ± 0.0056 ± 0.0092
0.1100	1.780	0.100	2.5	1.9	3.2	0.4	0.1	0.234E-06	0.3274 ± 0.0119 ± 0.0149
0.1100	2.500	0.134	1.8	1.2	1.4	0.4	0.1	0.114E-06	0.3363 ± 0.0066 ± 0.0089
0.1100	3.470	0.179	1.4	0.8	0.3	0.3	0.1	0.576E-07	0.3444 ± 0.0060 ± 0.0057
0.1100	4.460	0.218	1.2	0.5	0.4	0.3	0.1	0.338E-07	0.3422 ± 0.0063 ± 0.0047
0.1100	5.470	0.252	1.0	0.4	0.7	0.2	0.1	0.219E-07	0.3413 ± 0.0074 ± 0.0045
0.1100	6.800	0.259	0.9	0.3	0.9	0.3	0.3	0.139E-07	0.3445 ± 0.0069 ± 0.0046
0.1100	8.930	0.262	0.8	0.2	1.0	0.3	0.5	0.806E-08	0.3386 ± 0.0093 ± 0.0049
0.1100	11.460	0.251	0.2	0.1	1.0	0.2	0.7	0.503E-08	0.3442 ± 0.0076 ± 0.0044
0.1100	14.910	0.294	0.2	0.2	1.0	0.3	0.7	0.291E-08	0.3578 ± 0.0064 ± 0.0046
0.1100	19.800	0.360	0.2	0.0	1.0	0.4	0.8	0.158E-08	0.3558 ± 0.0050 ± 0.0047
0.1100	26.360	0.464	0.2	0.6	1.3	0.7	1.0	0.832E-09	0.3525 ± 0.0054 ± 0.0066
0.1100	34.470	0.603	0.2	0.5	1.7	1.4	1.3	0.446E-09	0.3801 ± 0.0108 ± 0.0098

x	Q^2 [GeV^2]	y	E [%]	E' [%]	AC [%]	RC [%]	RE [%]	$d^2\sigma^{meas}/dxdQ^2$ [b $\cdot$ GeV^{-2}]	F_2^d $\pm \Delta F_2^{stat}$ $\pm \Delta F_2^{syst}$
0.1400	1.860	0.082	3.0	2.4	3.5	0.4	0.1	0.171E-06	0.3536 $\pm$ 0.0201 $\pm$ 0.0185
0.1400	2.480	0.110	2.2	1.6	2.0	0.4	0.1	0.922E-07	0.3345 $\pm$ 0.0061 $\pm$ 0.0113
0.1400	3.480	0.142	1.6	1.0	0.7	0.3	0.1	0.450E-07	0.3337 $\pm$ 0.0051 $\pm$ 0.0070
0.1400	4.460	0.173	1.4	0.7	0.3	0.3	0.1	0.265E-07	0.3236 $\pm$ 0.0050 $\pm$ 0.0051
0.1400	5.470	0.202	1.2	0.5	0.5	0.3	0.1	0.171E-07	0.3301 $\pm$ 0.0059 $\pm$ 0.0046
0.1400	6.830	0.218	1.0	0.4	0.8	0.2	0.2	0.107E-07	0.3245 $\pm$ 0.0051 $\pm$ 0.0044
0.1400	8.930	0.221	0.9	0.3	1.0	0.2	0.4	0.617E-08	0.3368 $\pm$ 0.0081 $\pm$ 0.0050
0.1400	11.370	0.220	0.3	0.2	1.2	0.3	0.7	0.383E-08	0.3224 $\pm$ 0.0065 $\pm$ 0.0046
0.1400	14.940	0.235	0.2	0.2	1.3	0.2	0.7	0.222E-08	0.3269 $\pm$ 0.0051 $\pm$ 0.0049
0.1400	19.770	0.290	0.2	0.1	1.4	0.2	0.7	0.122E-08	0.3236 $\pm$ 0.0038 $\pm$ 0.0050
0.1400	26.540	0.374	0.2	0.1	1.4	0.4	0.8	0.636E-09	0.3247 $\pm$ 0.0039 $\pm$ 0.0055
0.1400	35.200	0.488	0.2	0.5	1.4	0.8	1.0	0.332E-09	0.3335 $\pm$ 0.0065 $\pm$ 0.0068
0.1800	2.670	0.092	2.5	1.8	1.7	0.4	0.1	0.609E-07	0.3313 $\pm$ 0.0092 $\pm$ 0.0117
0.1800	3.480	0.114	1.9	1.2	1.1	0.3	0.1	0.341E-07	0.3099 $\pm$ 0.0061 $\pm$ 0.0079
0.1800	4.470	0.136	1.6	0.9	0.6	0.3	0.1	0.199E-07	0.3143 $\pm$ 0.0061 $\pm$ 0.0060
0.1800	5.470	0.159	1.3	0.6	0.4	0.3	0.1	0.129E-07	0.3030 $\pm$ 0.0064 $\pm$ 0.0047
0.1800	6.860	0.178	1.1	0.4	0.5	0.3	0.2	0.792E-08	0.3057 $\pm$ 0.0056 $\pm$ 0.0042
0.1800	8.880	0.181	1.0	0.3	0.8	0.2	0.3	0.461E-08	0.2991 $\pm$ 0.0083 $\pm$ 0.0040
0.1800	11.310	0.197	0.9	0.2	1.0	0.2	0.5	0.282E-08	0.3016 $\pm$ 0.0077 $\pm$ 0.0045
0.1800	14.970	0.184	0.2	0.3	1.3	0.2	0.6	0.163E-08	0.3020 $\pm$ 0.0060 $\pm$ 0.0045
0.1800	19.840	0.229	0.2	0.1	1.5	0.2	0.6	0.891E-09	0.2933 $\pm$ 0.0043 $\pm$ 0.0049
0.1800	26.650	0.294	0.2	0.0	1.7	0.2	0.7	0.468E-09	0.2957 $\pm$ 0.0042 $\pm$ 0.0056
0.1800	35.130	0.378	0.2	0.6	1.9	0.4	0.8	0.252E-09	0.2950 $\pm$ 0.0052 $\pm$ 0.0065
0.1800	45.710	0.489	0.2	0.5	2.1	0.8	1.0	0.136E-09	0.3133 $\pm$ 0.0096 $\pm$ 0.0079
0.2250	2.900	0.079	2.5	1.8	0.9	0.3	0.1	0.397E-07	0.2961 $\pm$ 0.0263 $\pm$ 0.0096
0.2250	3.510	0.097	2.0	1.3	0.8	0.3	0.1	0.256E-07	0.2950 $\pm$ 0.0071 $\pm$ 0.0075
0.2250	4.490	0.113	1.6	0.9	0.7	0.3	0.1	0.150E-07	0.2824 $\pm$ 0.0061 $\pm$ 0.0057
0.2250	5.460	0.129	1.4	0.6	0.6	0.3	0.1	0.974E-08	0.2868 $\pm$ 0.0066 $\pm$ 0.0048
0.2250	6.870	0.155	1.2	0.4	0.6	0.3	0.1	0.591E-08	0.2807 $\pm$ 0.0056 $\pm$ 0.0039
0.2250	8.850	0.159	1.0	0.3	0.6	0.2	0.2	0.345E-08	0.2785 $\pm$ 0.0074 $\pm$ 0.0035
0.2250	11.350	0.162	0.9	0.2	0.7	0.2	0.5	0.206E-08	0.2837 $\pm$ 0.0076 $\pm$ 0.0037
0.2250	15.020	0.150	0.3	0.2	1.0	0.3	0.6	0.118E-08	0.2564 $\pm$ 0.0056 $\pm$ 0.0032
0.2250	19.860	0.185	0.3	0.1	1.3	0.2	0.6	0.652E-09	0.2641 $\pm$ 0.0041 $\pm$ 0.0039
0.2250	26.710	0.238	0.3	0.1	1.7	0.2	0.6	0.342E-09	0.2631 $\pm$ 0.0040 $\pm$ 0.0047
0.2250	35.280	0.305	0.3	0.6	2.0	0.3	0.6	0.185E-09	0.2547 $\pm$ 0.0045 $\pm$ 0.0057
0.2250	46.550	0.401	0.3	0.5	2.4	0.5	0.8	0.978E-10	0.2554 $\pm$ 0.0073 $\pm$ 0.0069
0.2750	3.750	0.085	1.9	1.1	1.7	0.3	0.1	0.171E-07	0.2679 $\pm$ 0.0117 $\pm$ 0.0074
0.2750	4.470	0.101	1.5	0.7	1.3	0.3	0.1	0.113E-07	0.2695 $\pm$ 0.0079 $\pm$ 0.0058
0.2750	5.470	0.109	1.3	0.5	1.0	0.3	0.1	0.727E-08	0.2602 $\pm$ 0.0074 $\pm$ 0.0045
0.2750	6.890	0.129	1.1	0.3	0.7	0.3	0.1	0.437E-08	0.2489 $\pm$ 0.0059 $\pm$ 0.0034
0.2750	8.810	0.156	0.9	0.1	0.6	0.2	0.1	0.254E-08	0.2470 $\pm$ 0.0083 $\pm$ 0.0028
0.2750	11.420	0.138	0.8	0.0	0.7	0.2	0.4	0.148E-08	0.2370 $\pm$ 0.0078 $\pm$ 0.0028
0.2750	14.860	0.145	0.8	0.0	0.8	0.2	0.5	0.852E-09	0.2400 $\pm$ 0.0076 $\pm$ 0.0030
0.2750	19.860	0.153	0.3	0.1	0.9	0.2	0.6	0.469E-09	0.2301 $\pm$ 0.0044 $\pm$ 0.0027
0.2750	26.720	0.195	0.3	0.3	1.2	0.2	0.6	0.247E-09	0.2239 $\pm$ 0.0040 $\pm$ 0.0032
0.2750	35.340	0.253	0.3	0.4	1.8	0.2	0.6	0.133E-09	0.2268 $\pm$ 0.0046 $\pm$ 0.0044
0.2750	46.960	0.332	0.3	0.5	2.4	0.4	0.7	0.701E-10	0.2299 $\pm$ 0.0069 $\pm$ 0.0059
0.2750	59.800	0.417	0.4	0.5	2.9	0.6	1.3	0.401E-10	0.1675 $\pm$ 0.0179 $\pm$ 0.0056

x	Q^2 [GeV^2]	y	E [%]	E' [%]	AC [%]	RC [%]	RE [%]	$d^2\sigma^{meas}/dxdQ^2$ [b $\cdot$ GeV^{-2}]	F_2^d $\pm \Delta F_2^{stat}$ $\pm \Delta F_2^{syst}$
0.3500	4.610	0.082	1.0	0.1	4.4	0.3	0.1	0.728E-08	0.2127 $\pm$ 0.0081 $\pm$ 0.0095
0.3500	5.450	0.097	0.8	0.2	3.3	0.2	0.1	0.484E-08	0.2217 $\pm$ 0.0069 $\pm$ 0.0076
0.3500	6.960	0.106	0.6	0.4	2.1	0.2	0.1	0.279E-08	0.2160 $\pm$ 0.0049 $\pm$ 0.0047
0.3500	8.810	0.125	0.5	0.5	1.2	0.2	0.1	0.164E-08	0.2016 $\pm$ 0.0057 $\pm$ 0.0028
0.3500	11.320	0.150	0.4	0.5	0.7	0.2	0.2	0.937E-09	0.1831 $\pm$ 0.0073 $\pm$ 0.0019
0.3500	14.810	0.126	0.3	0.6	0.9	0.2	0.6	0.534E-09	0.1680 $\pm$ 0.0052 $\pm$ 0.0021
0.3500	20.200	0.129	0.3	0.6	1.2	0.2	0.6	0.278E-09	0.1782 $\pm$ 0.0038 $\pm$ 0.0027
0.3500	26.640	0.155	0.4	0.6	1.4	0.2	0.6	0.153E-09	0.1677 $\pm$ 0.0028 $\pm$ 0.0028
0.3500	35.420	0.201	0.4	0.6	1.5	0.1	0.5	0.821E-10	0.1698 $\pm$ 0.0030 $\pm$ 0.0030
0.3500	46.630	0.259	0.4	0.5	1.6	0.2	0.5	0.445E-10	0.1633 $\pm$ 0.0038 $\pm$ 0.0031
0.3500	61.200	0.337	0.5	0.5	2.6	0.4	1.2	0.239E-10	0.1556 $\pm$ 0.0103 $\pm$ 0.0046
0.5000	5.720	0.071	2.2	3.3	9.4	0.2	0.1	0.191E-08	0.1148 $\pm$ 0.0100 $\pm$ 0.0117
0.5000	6.920	0.086	1.9	3.1	7.0	0.2	0.1	0.118E-08	0.1263 $\pm$ 0.0047 $\pm$ 0.0100
0.5000	8.880	0.093	1.8	3.0	4.4	0.2	0.1	0.641E-09	0.1053 $\pm$ 0.0039 $\pm$ 0.0060
0.5000	11.270	0.105	1.9	3.0	2.5	0.2	0.2	0.362E-09	0.1027 $\pm$ 0.0044 $\pm$ 0.0045
0.5000	14.370	0.133	1.4	2.6	1.5	0.1	0.2	0.206E-09	0.1085 $\pm$ 0.0061 $\pm$ 0.0036
0.5000	20.030	0.110	2.1	3.3	2.0	0.2	0.7	0.999E-10	0.0876 $\pm$ 0.0035 $\pm$ 0.0039
0.5000	27.190	0.116	0.9	0.7	2.8	0.1	0.6	0.509E-10	0.0848 $\pm$ 0.0020 $\pm$ 0.0026
0.5000	35.480	0.143	0.8	0.6	3.3	0.1	0.5	0.282E-10	0.0823 $\pm$ 0.0016 $\pm$ 0.0029
0.5000	46.620	0.183	0.8	0.6	3.6	0.1	0.5	0.153E-10	0.0805 $\pm$ 0.0020 $\pm$ 0.0030
0.5000	62.310	0.243	0.8	0.5	3.7	0.2	1.1	0.790E-11	0.0723 $\pm$ 0.0047 $\pm$ 0.0029

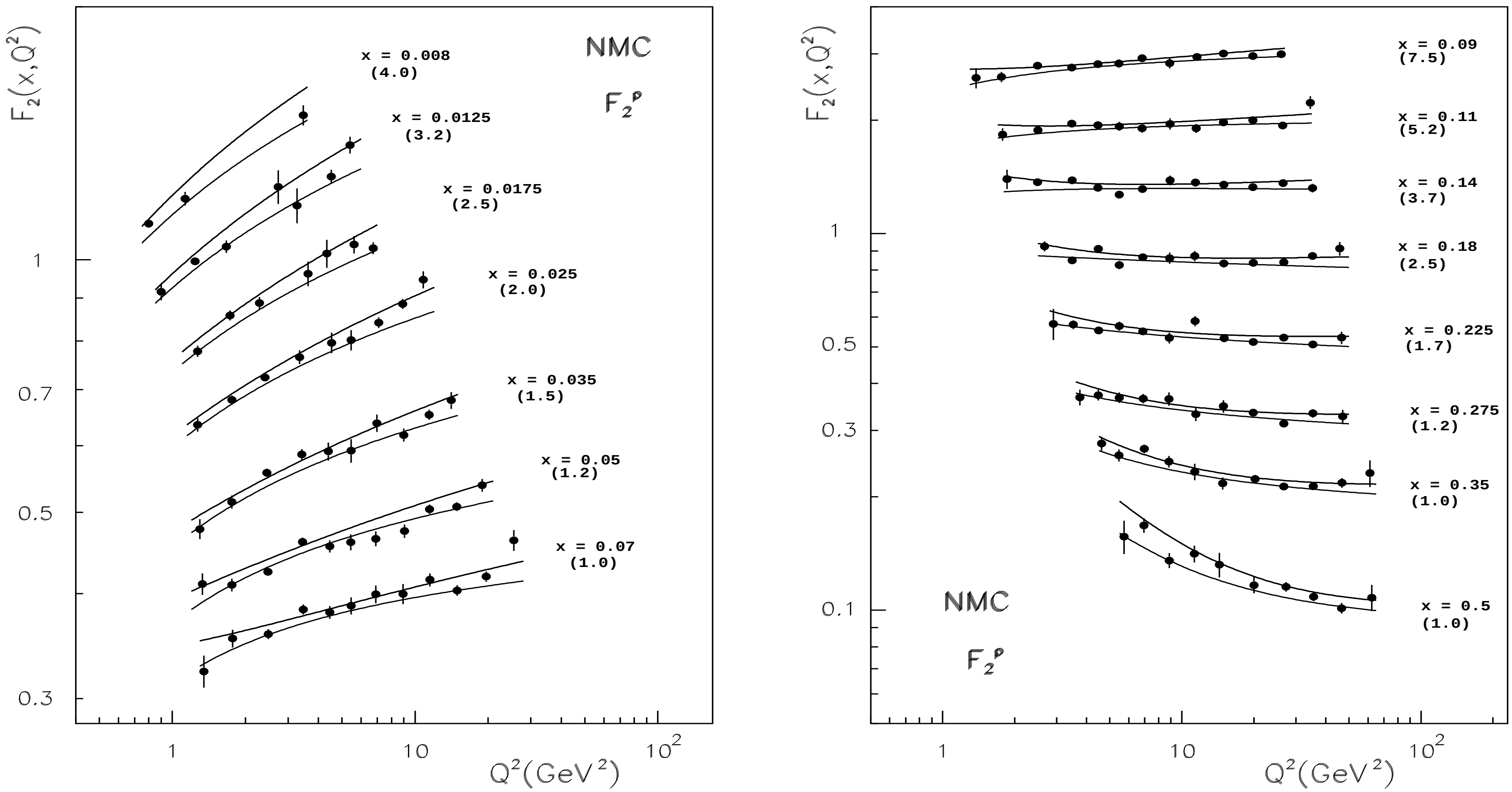

Figure 1: The proton structure function F_2^p. In the figure the data in each x bin have been scaled by the factors indicated in brackets for clarity. The error bars represent the statistical uncertainties, the solid lines the systematic uncertainties.

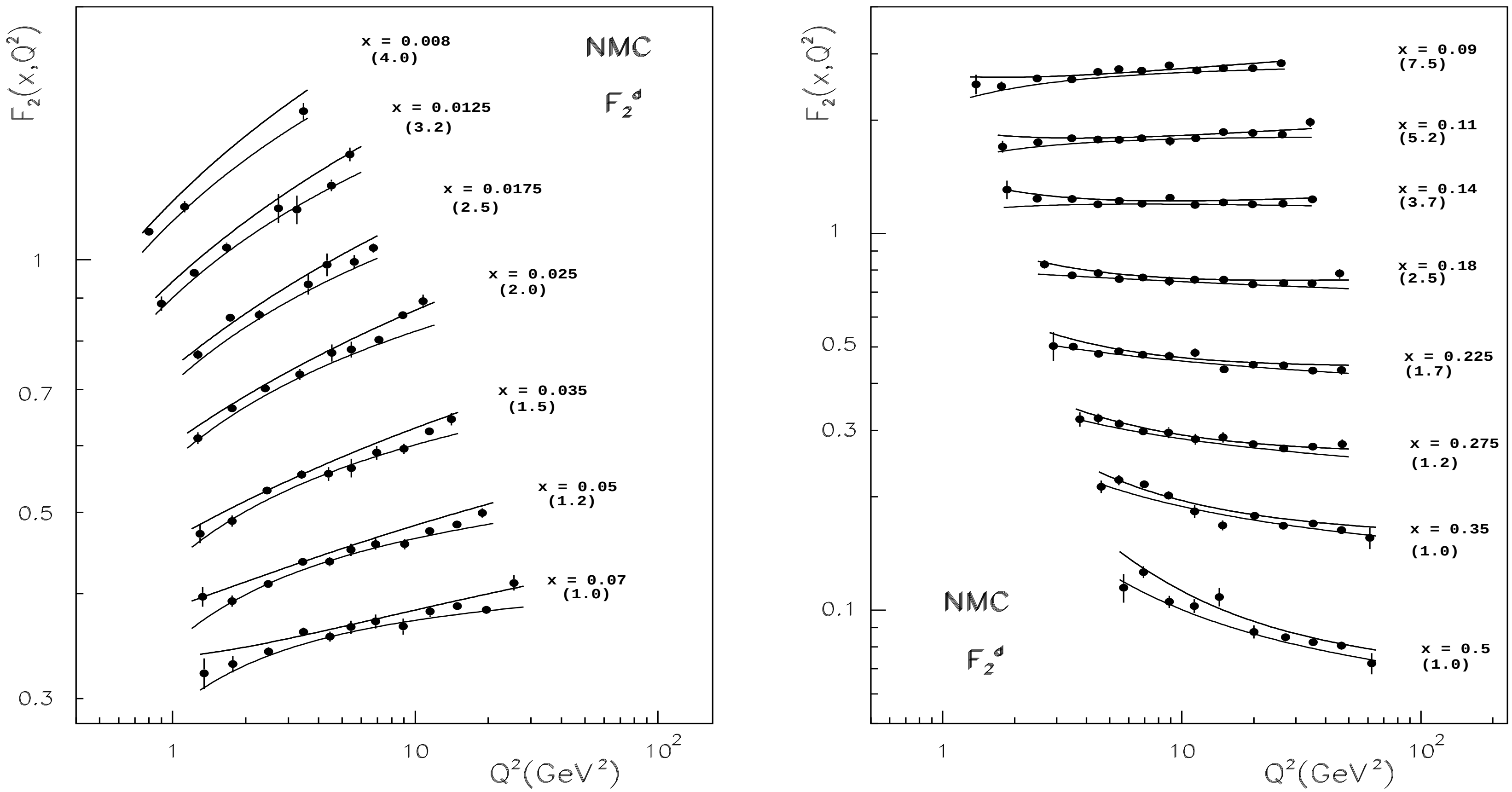

Figure 2: The deuteron structure function F_2^d. In the figure the data in each x bin have been scaled by the factors indicated in brackets for clarity. The error bars represent the statistical uncertainties, the solid lines the systematic uncertainties.

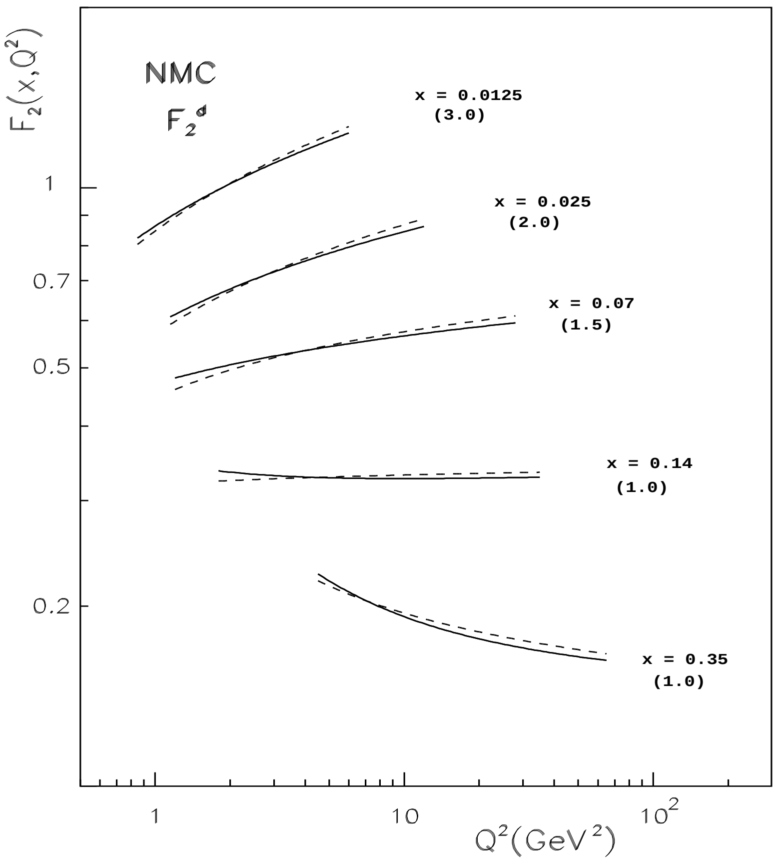

Figure 3: The effect of changes in the relative normalisations shown for five x bins. The solid lines represent the function fitted to the F_2 results, while the dashed lines show a similar fit with the 90 GeV data lowered by 2% and the other three data sets raised by 2%.

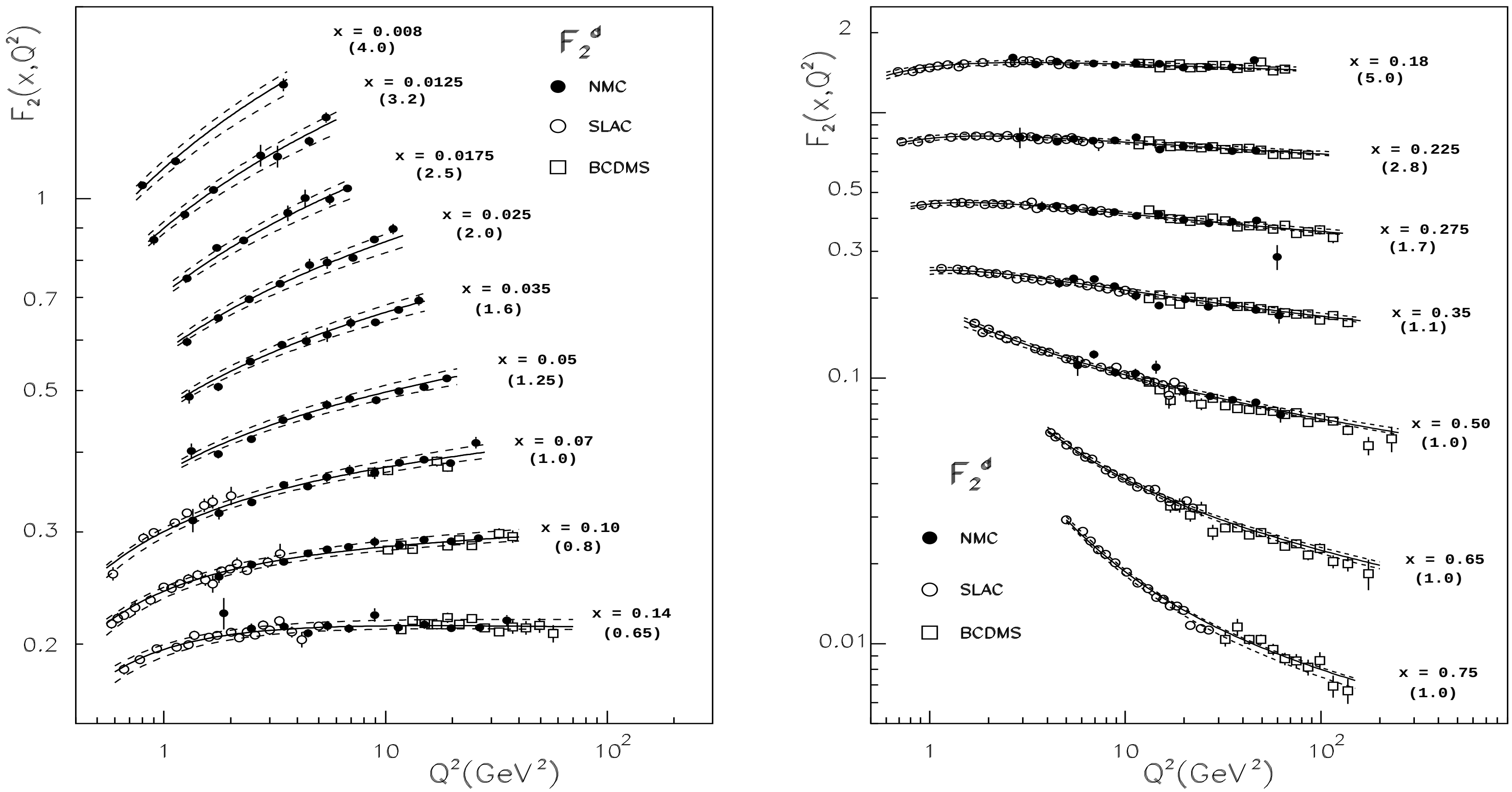

Figure 4: The deuteron structure function F_2^d. The NMC results are compared with those of SLAC [9] and BCDMS [10]. The points have been renormalised according to the values resulting from the fit, and the BCDMS data have also been adjusted for the energy recalibration obtained from the fits. The SLAC and BCDMS values were rebinned to the NMC x bins. The error bars represent the statistical errors. The solid curves are the result of the fit of the 15-parameter function (eq. (2)) to the three data sets. The dashed curves indicate the total uncertainty. The data in each x bin are scaled by the factors indicated in brackets for clarity.

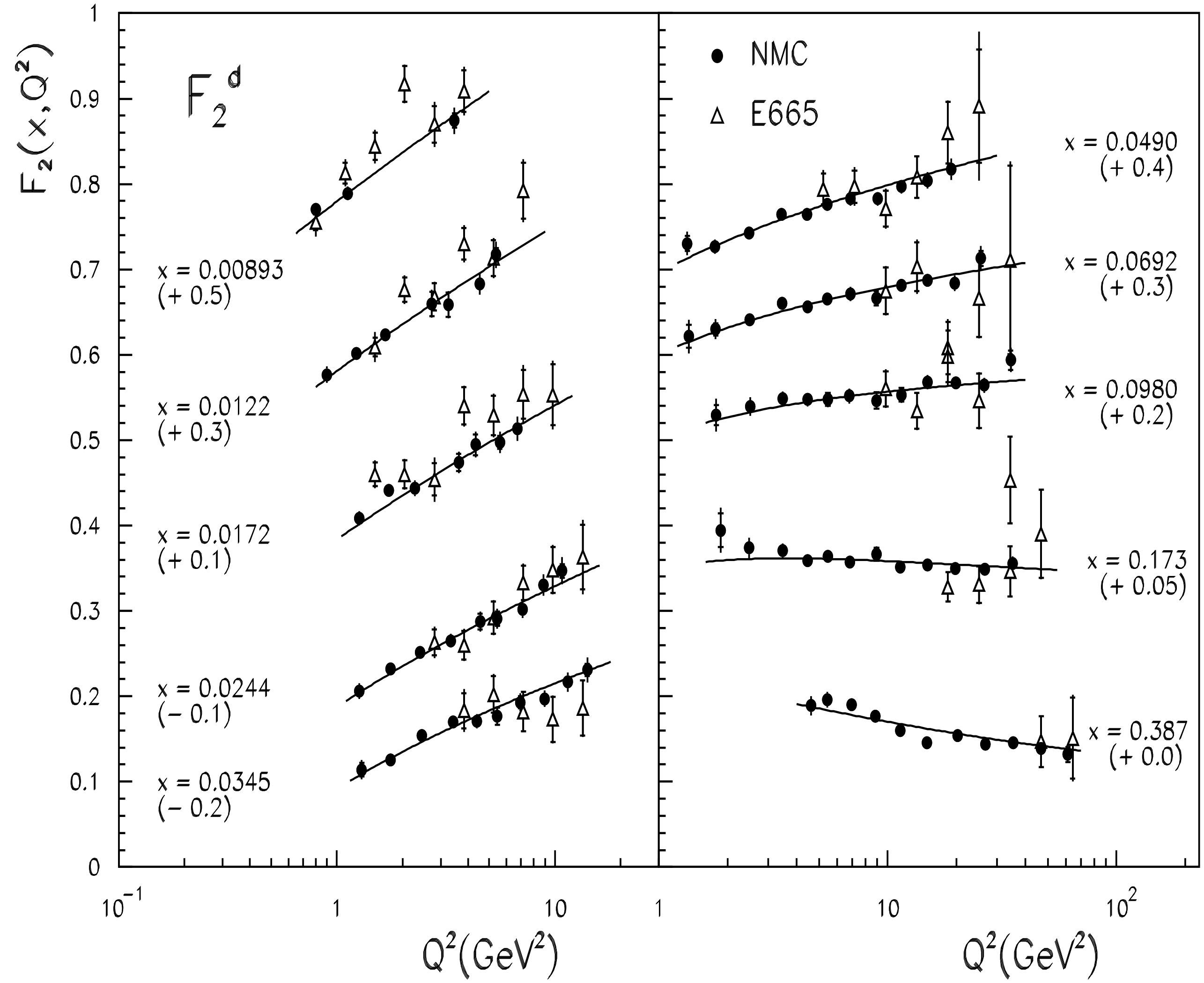

Figure 5: Comparison of the NMC and E665 [11] results for F_2^d. The data of NMC were interpolated to the x bins of the E665 data using the current parametrisation of F_2^d. The inner error bars indicate the statistical errors, the outer bars the quadratic sum of the statistical and systematic errors. The lines correspond to the F_2 parametrisation, as shown in fig. 4. The data in each x bin are offset by the amounts indicated in brackets.

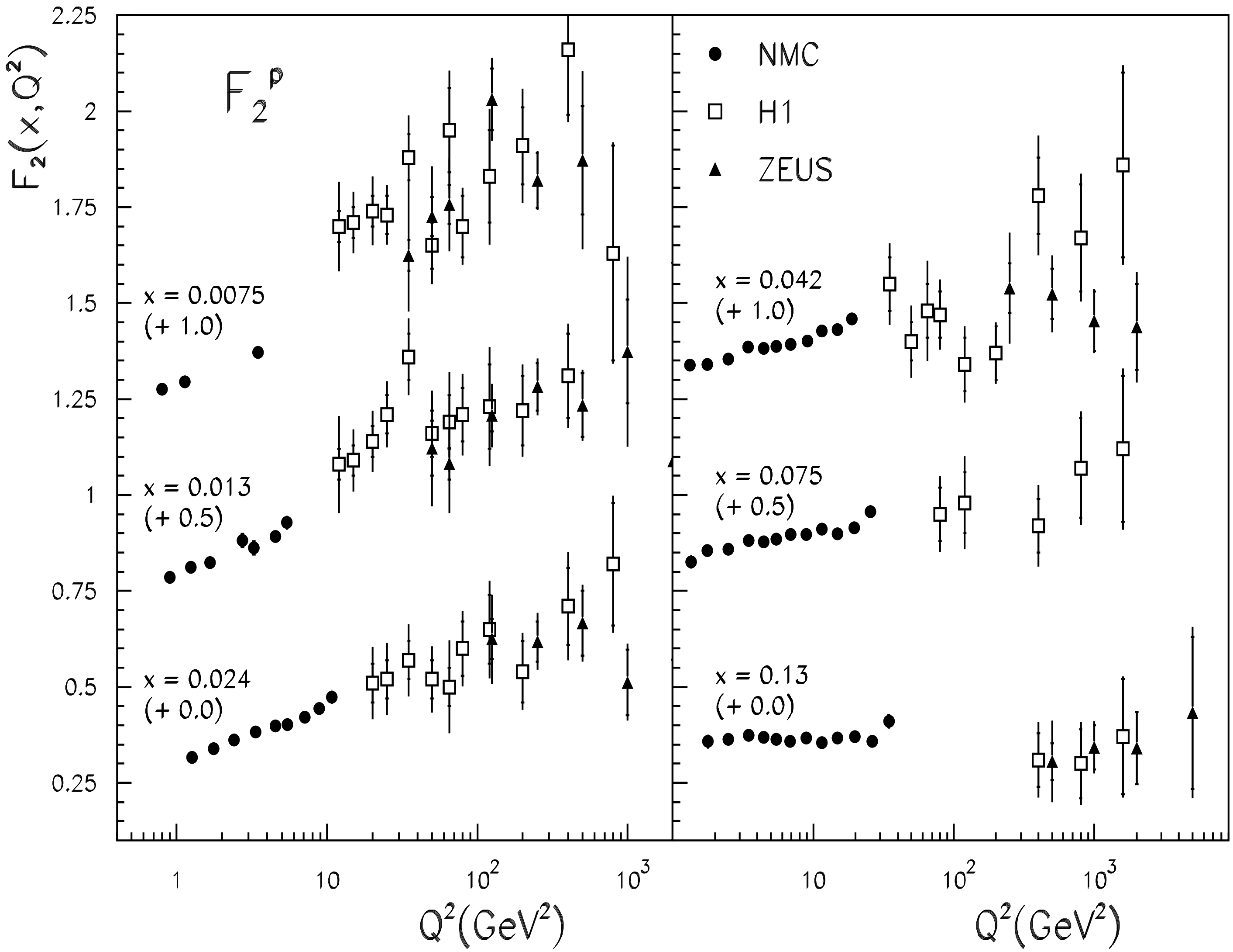

Figure 6: Comparison of the NMC and HERA results for F_2^p. The data of NMC and ZEUS data were interpolated to the x bins of H1 [12], using the current parametrisation for the NMC data and that of ref. [13] for the ZEUS data. The inner error bars indicate the statistical errors, the outer bars the quadratic sum of the statistical and systematic errors. The data in each x bin are offset by the amounts indicated in brackets.